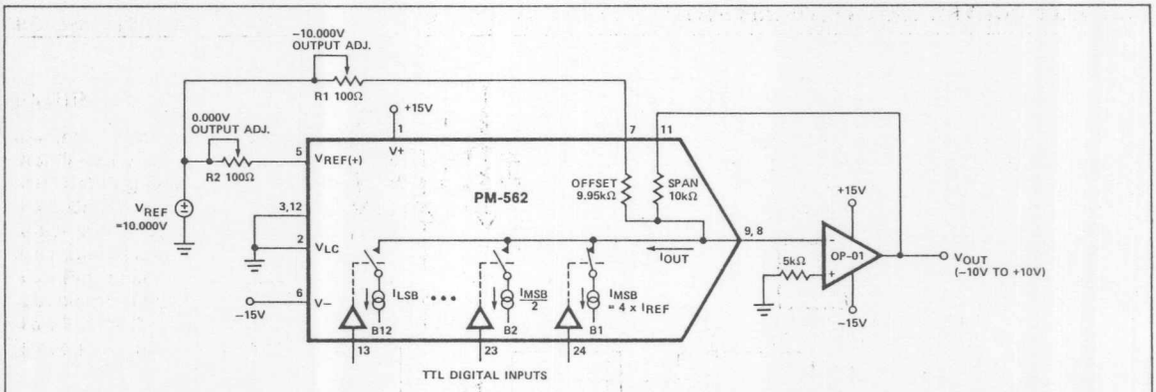
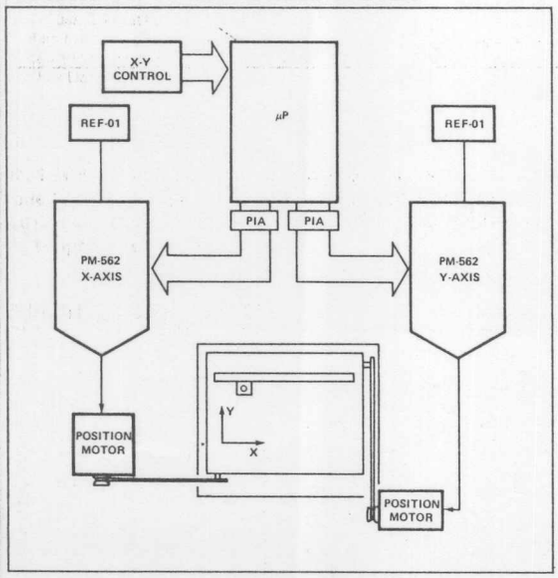


NOTES:

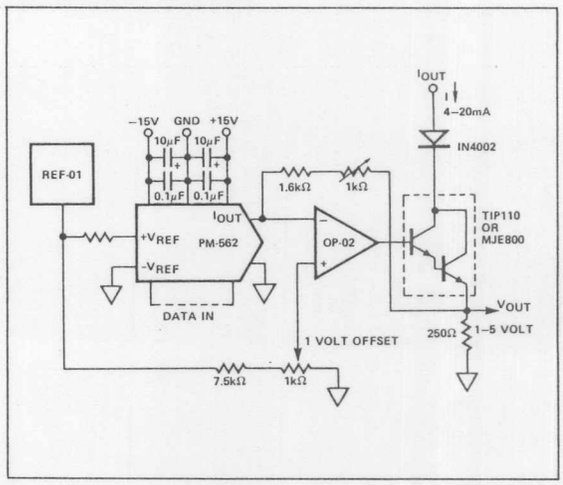
1. Calibration Procedure: Set $V_{REF} = 10.0000V$. Next set digital inputs B_1 thru B_{12} to digital zero and adjust R_1 until $V_{OUT} = -10.0000V$. Set digital inputs B_1 thru B_{12} to 1000 0000 0000 (i.e. only turn ON MSB) and adjust R_2 until $V_{OUT} = 0.0000V$.
2. Bypass V+ and V− supplies with 0.01μF in parallel with 1μF capacitors.

FIGURE 3: ±10V Bipolar Voltage Output

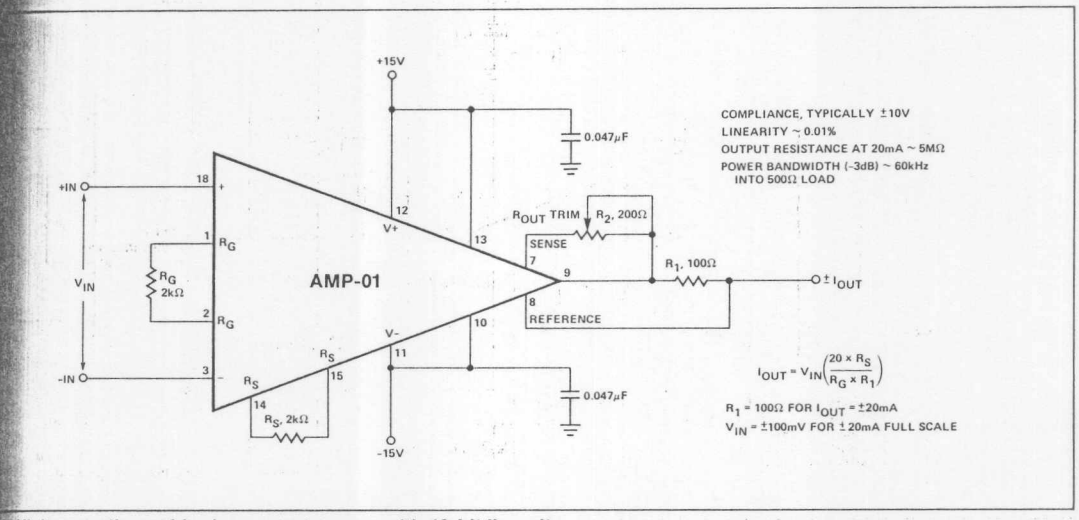
PRECISION X-Y POSITIONING SYSTEM



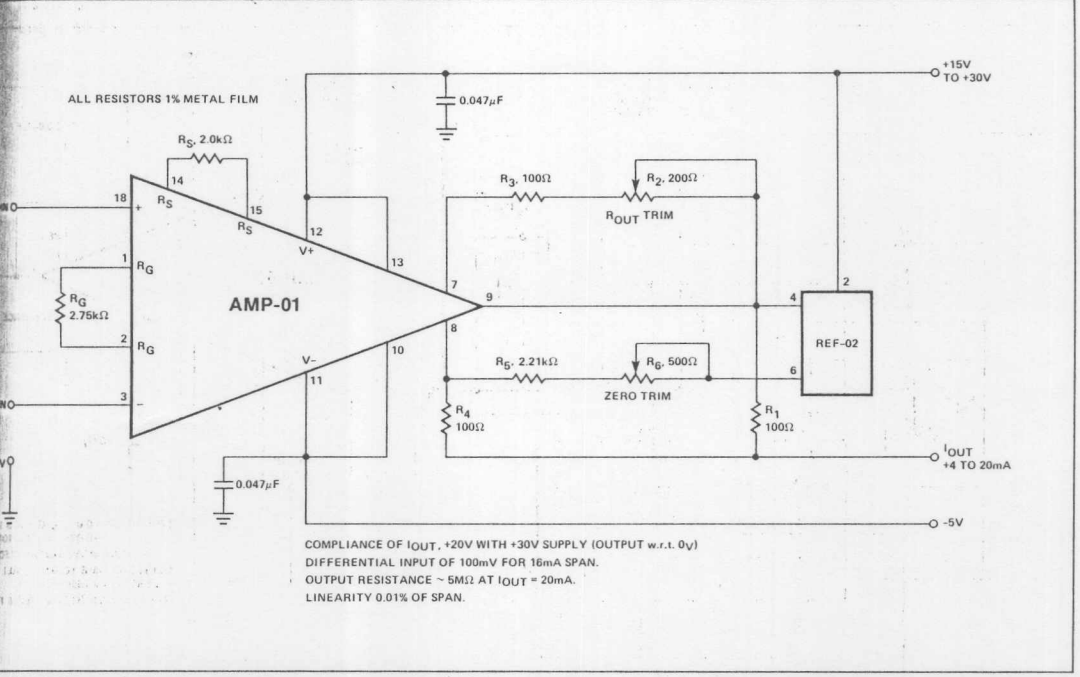
4-20mA TRANSMITTER



ATIONS INFORMATION

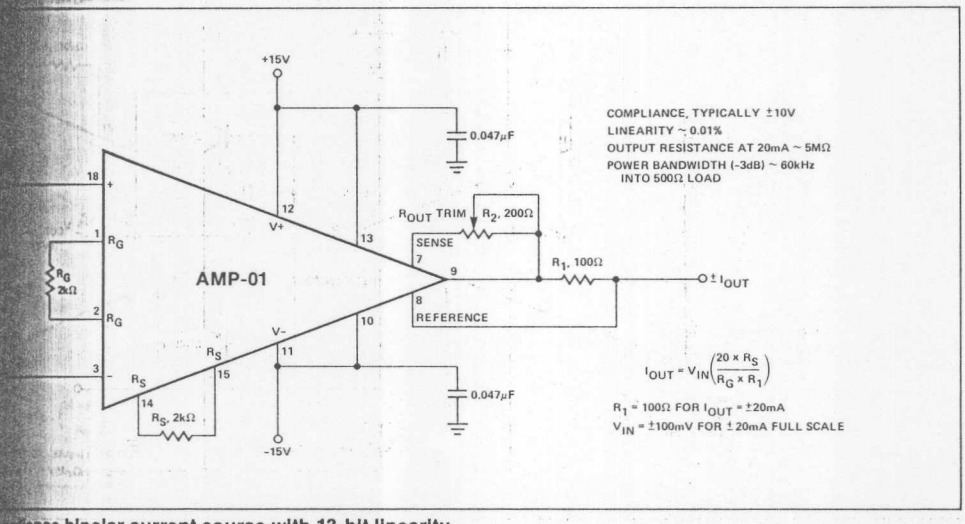


7. High-compliance bipolar current source with 13-bit linearity.

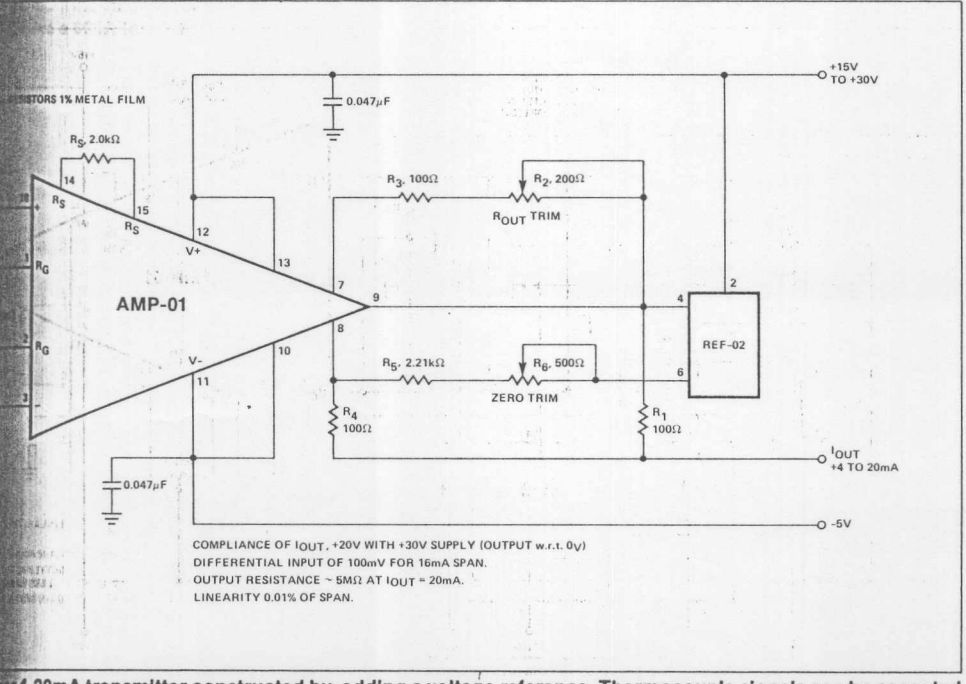


8. 13-bit linear 4-20mA transmitter constructed by adding a voltage reference. Thermocouple signals can be accepted without preamplification.

FORMATION



iance bipolar current source with 13-bit linearity.



r 4-20mA transmitter constructed by adding a voltage reference. Thermocouple signals can be accepted amplification.

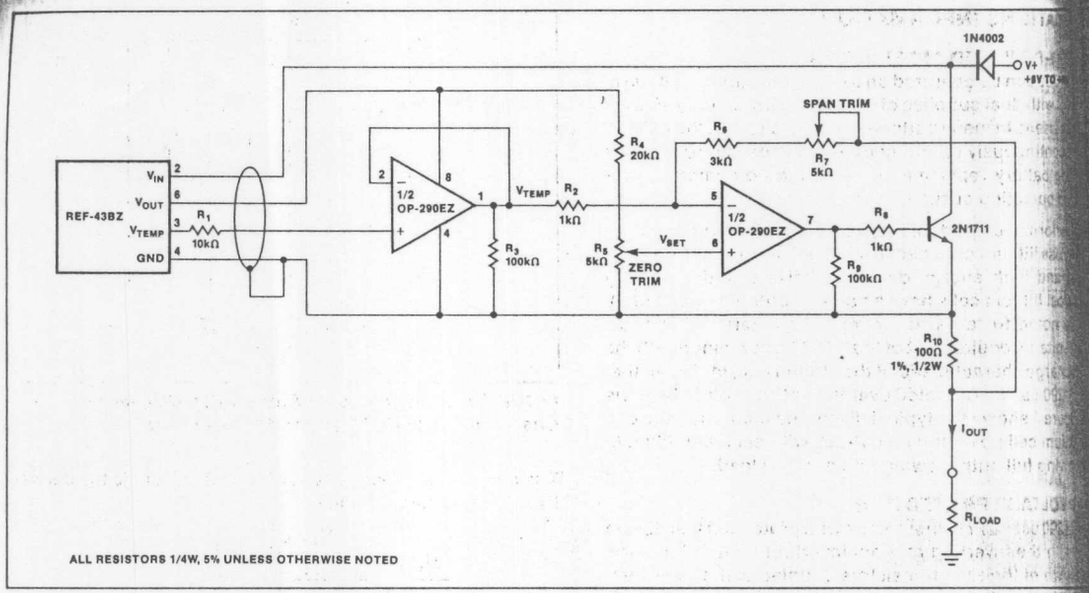


FIGURE 2: *Temperature to 4-20mA Transmitter*

VARIABLE SLEW RATE FILTER

The circuit shown in Figure 3 can be used to remove pulse noise from an input signal without limiting the response rate to a genuine signal. The non-linear filter has use in applications where the input signal of interest is known to have physical limitations. An example of this is a transducer output where a change of temperature or pressure cannot exceed a certain rate due to physical limitations of the environment. The filter consists of a comparator which drives an integrator. The comparator compares the input voltage to the output voltage and forces the integrator output to equal the input voltage. A_1 acts as a comparator with its output high or low. Diodes D_1 and D_2 clamp the voltage across R_3 forcing a constant current to flow in or out of C_2. R_3, C_2 and A_2 form an integrator with A_2's output slewing at a maximum rate of:

$$\text{Maximum slew rate} = \frac{V_D}{R_3C_2} \approx \frac{0.6V}{R_3C_2}$$

For an input voltage slewing at a rate under this maximum slew rate, the output simply follows the input with A_1 operating in its linear region.

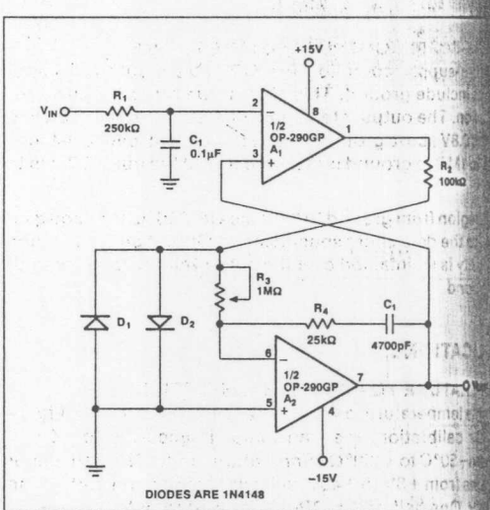
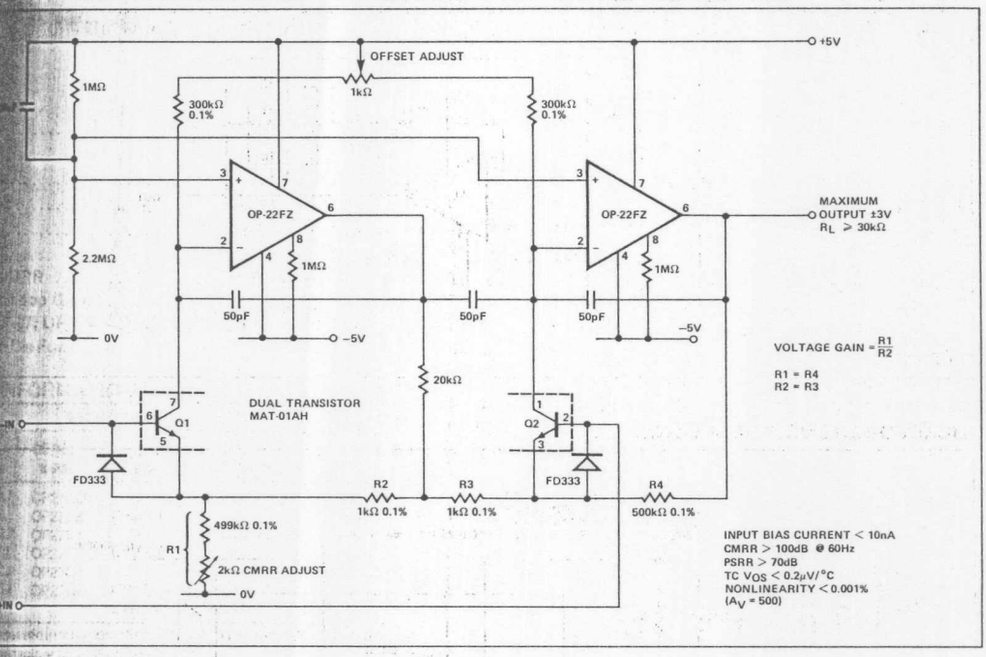


FIGURE 3: *Variable Slew Rate Filter*

INSTRUMENTATION AMPLIFIER — POWER DRAIN ≤ 3mW WITH ±5 VOLT SUPPLIES



2, the OP-22 is used as a gated amplifier where consumption and bandwidth are controllable. R_S can ed for a specific lower-power operation or omitted plifier can be completely shut down.

ower instrumentation amplifier that consumes less with ±5V supplies is shown in Figure 3. Offset rift is less than 0.2μV/°C and common-mode ge is ±3V with CMRR of over 100dB at 60Hz.

control systems use two-wire 4-20mA current trans- hen sending analog signals through noisy environ- he "zero" or "offset" current of 4mA may be used to e transmitter signal conditioning amplifiers and/or d.c. transducer. This allows remote signal condition- ut having a remote power source. Power is provided ceiving end where the signal current is monitored by on 50Ω resistor. The 4-20mA transmitter shown in has high stability, excellent linearity, and generates mA current output. A 5V reference is available for g transducers and micropower amplifiers at a maxi- rrent of 2mA.

TWO TERMINAL 4-20mA TRANSMITTER

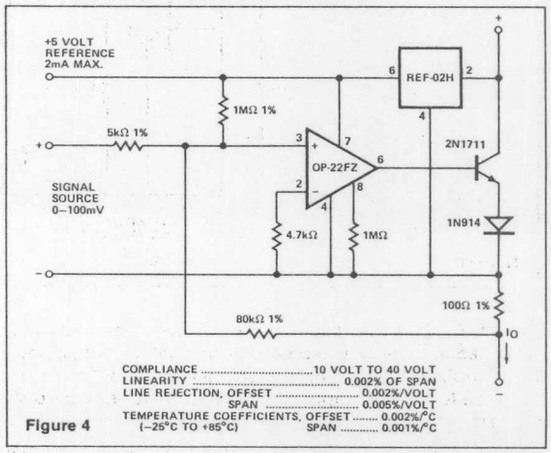


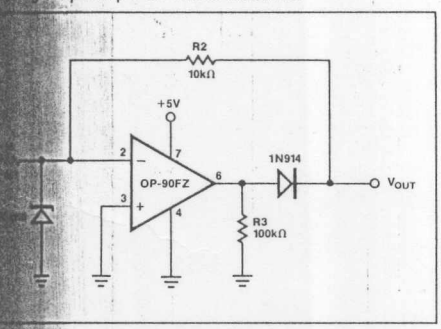
Figure 4

...at 25°C produces minimum drift over temper-... references can have start-up problems. With ...1 and R2, the OP-90 is beyond its positive input ...has an undefined ouput state. Shorting Pin 5 ...t pin) to ground forces the output high under ...and insures reliable start-up without signifi-...g the OP-90's offset drift.

...P FULL-WAVE RECTIFIER

...a full-wave rectifier circuit that provides the ...of input signals up to ±2.5V even though ...a single 5V supply. For negative inputs, the ...as an unity gain inverter. Positive signals force ...utput to ground. The 1N914 diode becomes ...d and the signal passes through R1 and R2 to ...nce output impedance is dependent on input ...mpedances cause an asymmetric output. For ...mpedances, this can be corrected by reducing ...r heavy loads can be buffered by a second ...6 shows the output of the full-wave rectifier ...0Hz Input signal.

...ngle Op-Amp Full Wave Rectifier



...wo Wire 4-20mA Transmitter

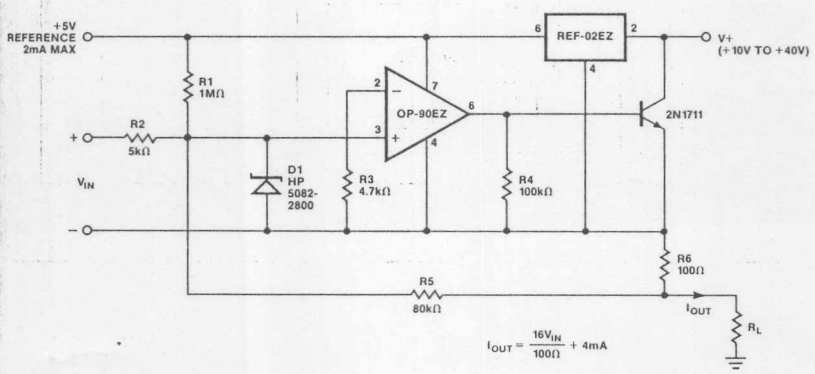
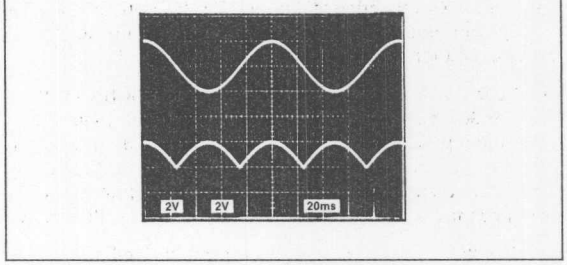


FIGURE 6: Output of Full-Wave Rectifier With $4V_{p-p}$, 10Hz Input



TWO WIRE 4-20mA CURRENT TRANSMITTER

The current transmitter of Figure 7 provides an output of 4mA to 20mA that is linearly proportional to the input voltage. Linearity of the transmitter exceeds 0.004% and line rejection is 0.0005%/volt.

Biasing for the current transmitter is provided by the REF-02EZ. The OP-90EZ regulates the output current to satisfy the current summation at the noninverting node:

$$I_{OUT} = \frac{1}{R6}\left(\frac{V_{IN}\,R5}{R2} + \frac{5V\,R5}{R1}\right)$$

For the values shown in Figure 7,

$$I_{OUT} = \left(\frac{16}{100\Omega}\right)V_{IN} + 4mA$$

giving a full-scale output of 20mA with a 100mV input. Adjustment of R2 will provide an offset trim and adjustment of R1 will provide a gain trim. These trims do not interact since the noninverting input of the OP-90 is at virtual ground. The Schottky diode, D1, prevents input voltage spikes from pull-